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ARIZONA DEPARTMENT OF PUBLIC SAFETY

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May 26, 1993

Ms. Donna Searcy
Secretary
Federal Communications Commission
1919 M. St. NW, Room 222
Washington, D.C. 20554

Re: PR Docket No. 92-235 / Spectrum Refarming

Dear Ms. Searcy:

Attached are 9 sets of comments of the State of Arizona, Department of Public Safety to the Commissions' plan for "Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services and to Modify Polices Governing Them." (PR Docket 92-235)

These comments reflect the opinion of the Arizona Department of Public Safety (ADPS) and other State Governmental agencies for which ADPS provides radio facilities, engineering, and maintenance services.

Respectfully Submitted,

Richard G. Carlson, Assistant Director
Arizona Department of Public Safety

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BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of:	)	
	)	
Replacement of Part	)	
90 by Part 88 to	)	
Revise the Private	)	PR Docket No. 92-235
Land Mobile Radio	)	
Services and Modify	)	
Policies Governing	)	
Them.	)	

TO: The Commission

COMMENTS OF
THE ARIZONA DEPARTMENT OF PUBLIC SAFETY
for the
STATE OF ARIZONA

INTRODUCTION

The Arizona Department of Public Safety (ADPS) maintains the lead role in State Public Safety communications, pursuant to Arizona Revised Statute 41-1749A. ADPS has queried several of the larger State agencies that are serviced by the Department and has compiled summary data of their comments along with those of ADPS. This data provides the basis for our comments and accurately reflects our position toward the "Spectrum Refarming proposal described in PR Docket No. 92-235.

BACKGROUND AND DEMOGRAPHICS

The State of Arizona encompasses almost 114,000 square miles. Much of the State is sparsely populated Federal land, with two major population centers, in the Phoenix and Tucson areas. The State currently has over 3.5 million residents. Projections expect the population to increase to 6.5 million people by the year 2000. The population density, however, is still only about 25

persons per square mile. Much of the rapid growth has been concentrated in the two main population centers. Median projections indicate a continuing average growth rate of about 5% annually.

This rapid population growth has generated additional needs for communications facilities. Many existing Statewide radio systems have been significantly enhanced in the last decade with the addition of new VHF, UHF, and 800 MHz repeater channels. New sites have been developed to provide the required coverage necessary on these bands, given presently permissible ERP's and site restrictions.

Existing Statewide systems, including those of ADPS, operate from 30 to 50 remote mountain-top sites, with ERP's ranging from 200 to 1,000 watts. HAAT's for these sites typically range from 500 feet to over 4,000 feet. Mobile radios for Highway Patrol units, Game and Fish officers, and Parks and Forestry officers operate at ERP levels from 100 to 200 watts.

These high power, mountain-top sites provide a bare minimum of coverage for effective operation of Statewide Public Safety radio systems for various State law enforcement, emergency medical, forestry, wildlife management, and highway maintenance personnel.

ADPS maintains approximately 150 base/mobile relay stations, 1,500 mobile radios, and 1,000 portable radios for its own statewide systems use. The Department also maintains 55 base/mobile relay stations and 2,000 mobile and portable radios for the Arizona Department of Transportation along with major statewide radio systems for the Arizona Game and Fish Department, the State Land Department, the State Parks Board, the State Agriculture

Department, the State Military Department, and the Arizona Department of Corrections (base/mobile relay stations only).

GENERAL STATEMENT:

ADPS supports the concept of spectrum efficiency and increased utilization through cost-effective, enhanced technology, as it becomes available. ADPS notes that Public Safety communications have traditionally been in the forefront of more efficient spectrum utilization through the early use of FM narrowband modulation and the APCO 16 industry standard for Public Safety trunking technology. The new APCO 25 Interim Standard for digital radio systems promises to provide similar benefits to the mobile two-way industry. ADPS feels that similar spectrum efficiency requirements should be imposed on other users of spectrum (e.g. broadcasters) to ensure the availability of necessary spectrum for Public Safety in compliance with the Communications Amendment Act of 1982 as it applies to Section 1 of the Communications Act of 1934.

ADPS supports the comments of the International Associated Public Safety Communications Officers, Inc. (APCO) as well as those of the Arizona APCO Chapter. ADPS is submitting separate comments because of the unique needs of the State of Arizona, and to define the costs for the State of Arizona to implement the proposals in Docket 92-235. ADPS is especially concerned that proposed changes in modulation, bandwidth, and Effective Radiated Power (ERP) that are implemented in too short a time frame, will result in the early obsolescence of millions of dollars of radio equipment, for which the Arizona State budget will be inadequate to allow replacement in the near future.

ADPS believes that the proposed re-write of Part 90, as presented in Docket 92-235, is not a cost effective means of achieving spectrum efficiency, and is not acceptable to the State of Arizona in two major areas of concern. The first area of concern relates to the mandatory ERP reductions which would force the State to construct at least 200 new sites (more than 4 times our current number) and require the use of many new VHF, UHF, and microwave frequencies. The second area of concern relates to time frames for conversion to narrowband technologies which are currently not fully developed or in their present form do not meet the needs of Public Safety.

ADPS believes that Public Safety communications services in Arizona would best be served by establishment of a separate Part in the Rules strictly for Public Safety Radio Services, which would continue the traditional Public Safety Radio Services because they are sufficiently unique in their needs. ADPS does advocate, however, a frequency realignment in the 150-174 MHz

of skip, it does not seem appropriate at this time to mandate narrow bandwidths nor to make other changes. Since this band is becoming less relevant to Public Safety communications as time goes on, frequencies in this band may be offered in trade for an equivalent amount of spectrum in the high VHF, UHF, or 800 MHz bands.

ADPS does suggest that slow, phased, bandwidth reductions are in order in the 72-76 MHz Mid-Band, the 150-174 MHz VHF High Band, and the 450-470 MHz UHF Band. To the maximum extent possible, ADPS believes that small municipalities should be encouraged to use 800 MHz channels for their communications thereby freeing up the 150-174 MHz band for assignment to wide area systems, especially statewide systems which require good propagation over widely varying terrain conditions. ADPS believes that a Regional plan would help accelerate this process.

TRANSMITTER POWER/ANTENNA HEIGHTS:

ADPS takes very strong exception to the Commission's table of allowable ERP versus Height Above Average Terrain (HAAT). In Arizona, most of the remote mountain-top sites have HAAT's in excessive of the 500 foot limit, which would restrict ERP to 5 watts. ADPS currently uses over 50 sites to cover almost 114,000 square miles to about the 85% level of radio coverage. Mountain-top stations currently have ERP's at VHF of up to 400 watts and at UHF of up to 600 watts. Reduction of these ERP's to 5 watts constitutes a better than 20 dB reduction in power.

Using standard commercial propagation contour software (Softwright TAP 2.3), it has been determined that an increase in the number of sites of from 4-5 times will be necessary. Since

most available, developed sites have already been used, this will require major site development at approximately 200 new locations. ADPS has developed a standard site development cost factor of $ 400,000 per site for an undeveloped location. This translates to a total cost for site development of $ 80,000,000. An additional $ 5,000,000 will be required for expanded dispatch capabilities to support these new sites.

This approach is simply not possible or acceptable to the State in the foreseeable future. ADPS feels that sites could not be constructed in the next 5 years, even if funding were available. Engineering and construction for such a huge number of locations would take an estimated 20 years at 10 sites per year. This approach will also be very spectrally inefficient because of the requirement for new VHF and UHF frequencies at the new sites plus the need for microwave frequencies to link the wide-area system together.

ADPS suggests that the Commission use the alternative approach of utilizing Regional Planning Committees to ensure that coverage of only the user service area is met through the use of dBu contour maps. This approach would leave the transmitter power, ERP, antenna type, direction, downtilt, etc. to the system designer and the Regional Planning Committee. ADPS suggests that a standard 39 dBu contour at VHF and 41 dBu contour at UHF be used to establish the boundaries of the user service area. These contours will provide a 95% probability of communications with mobile units. Additional power might be allowed to provide for coverage to portable radios in remote areas.

A co-channel applicant should be limited to a system operation that produces no more than 21 dBu (VHF) or 23 dBu (UHF) signal at the existing station's 39 or 41 dBu contour respectively.

This approach provides at least 18 dBu protection from co-channel users.

Regardless of approach, ADPS suggests grandfathering of existing systems at their current ERP levels indefinitely or until such time as the license must be modified. This approach will ensure continuity of existing Public Safety services without interruption to the public and will spread out the extremely costly burden to the taxpayer for construction of new sites.

CHANNEL SPACING AND BANDWIDTH CONSIDERATIONS:

ADPS believes that reduction of channel spacing at VHF and UHF from 25 Khz to 12.5 Khz is both a desirable and achievable goal that should be implemented in a realistic time frame. These reductions can begin most easily in the 460-470 MHz band, where there are few low-power channels in use operating at 12.5 kHz offset. The newly defined split channels should be made available for full high power primary use, 1 year after Notice of Final Rulemaking (NFR) in locations where there would be no interference as certified by the Regional Planning Committee.

In the 450-460 MHz band, many of the offset 12.5 kHz channels are currently used for low-power fixed control links. Reduction of channel spacing to 12.5 kHz in this band should retain the low power restriction until the ten-year point, when full power primary operation would be allowed. In the 150-174 MHz band, channels should be reduced to 12.5 kHz beginning 5 years after the NFR in locations where there would be no interference.

Licensing of 12.5 kHz channels after 5 years should be contingent upon non-interference as certified by the Regional Planning Committee. All systems in these bands should be fully 12.5

kHz operational ten years after the NFR.

The equipment bandwidth reduction and spectrum efficiency process should begin by first requiring all users to reduce transmitter FM deviation to 4 kHz within 1 year of the NFR and by relaxing the VHF 10 mile adjacent channel rule. This will increase the number of licensable channels. ADPS believes that reducing the FM deviation below 4 kHz on existing systems will reduce system gain and audio levels to an unacceptable point and will require the addition of a number of costly sites to maintain existing radio coverage. The reduction in deviation to 4 kHz results in a 15 kHz non-interference bandwidth or a 12.5 kHz limited interference bandwidth.

ADPS recommends 12.5 kHz channel spacing as a ten year goal based on statements from equipment vendors that they can manufacture radios capable of operating within a 12.5 kHz bandwidth almost immediately. There are both digital and analog means of meeting this goal. Based on this information, ADPS is recommending that all radios manufactured 5 years following the NFR, should be designed for 12.5 kHz bandwidths.

ADPS believes that the future for Public Safety voice communications, lies in digital modulation techniques. As digital radios become more prevalent, all adjacent channel restrictions at 12.5 kHz can be lifted.

ADPS rejects the concept of setting a firm timetable for 6.25 kHz channels at UHF and 5 kHz channels at VHF. Equipment vendors indicate that it may be possible to produce radios meeting the 6.25 kHz bandwidth by the year 2000. They state that under no conditions can they see any digital means of meeting a 5 kHz channel requirement. The only modulation which is known

to work within 5 kHz channels is Amplitude Compandored Single Sideband (ACSB). This modulation is not acceptable for Public Safety application because of its high susceptibility to man-made noise and lack of data throughput.

ADPS recommends that the Commission revisit the bandwidth issue ten years after the NFR. Based on manufacturer input, a goal of 6.25 kHz channels may be met at that time and a new time-frame can be set for overall conversion to the narrower channels. After 10 years, restrictions of distance separation or dBu contours for adjacent channel spacing at 12.5 kHz should be relaxed for both VHF and UHF.

INNOVATIVE SHARED USE CHANNELS:

ADPS strongly disagrees with the proposal to place Innovative Shared Use systems within the Public Safety spectrum. This proposal not only takes away from Public Safety some of the channels that would be derived from channel splitting, but it also creates a myriad of technical, operational, coordination, and flexibility problems.

EXCLUSIVE USE OVERLAYS:

ADPS agrees with the concept of Exclusive Use Overlays (EUO) where appropriate, as determined by the Regional Planning Committee. This concept will encourage enhanced system design and overall spectrum efficiency.

ADPS favors the Commission's second option for EUO's of wide area systems. This option provides for loading criteria to be proportional to the total geographic area protected from further licensing, when each site provides the standard 80 Km protection. The example

presented in the Notice discussion resulted in protection of 100,000 square kilometers with ten sites. In Arizona, with 183,000 square kilometers, it appears that a system with about twenty sites statewide would qualify for an EUO. Most of our systems meet this standard. ADPS would, however, like to see exceptions for lower densities granted in rural environments.

In the case of statewide EUO licensed users, ADPS suggests no ERP limitations, or contour dBu restrictions. This will allow sufficient design latitude to provide coverage throughout the state through sufficient ERP and site overlap, and will allow interface with adjacent states as required.

ADPS would also like to see, as an adjunct to EUO's, trunking of channels permitted in the 150-174 MHz band and especially in the 450-470 MHz band. ADPS feels that it would be appropriate to establish a nationwide group of five channels in the 150-174 MHz band and the 450-470 MHz band for emergency usage. These channels would be similar to the five nationwide common calling and inter-operability channels in the NPSPAC spectrum.

LOADING STANDARDS:

ADPS agrees with the concept of differentiating loading standards by band and location. Some State systems, especially in the Highway Maintenance and Forestry/Conservation radio services, require usable frequencies in remote locations for limited numbers of radios. The functions of these stations include maintenance and repair of roads and bridges, snow and landslide removal, and recovery from floods. These functions serve the public every bit as much as regular police and fire channel functions. It is appropriate for the Commission to suggest a lower number of radios for system loading in such cases.

SEPARATE PAGING CHANNELS:

ADPS supports the idea of special dedicated channels strictly for public safety paging. This approach would result in far fewer adjacent channel interference problems, especially with 12.5 kHz channels. ADPS also recommends that paging operations conducted on a licensees voice channels, be constrained to the power levels necessary to conform with the recommended 39 dBu and 41 dBu service contours for VHF and UHF.

CONSOLIDATION OF SERVICES:

ADPS supports the retention of the Local Government Radio Service, Police Radio Service, Fire Radio Service, Highway Maintenance Radio Service, Forestry/Conservation Radio Service, and the new Emergency Medical Radio Service as the component parts of the Public Safety Radio services. ADPS agrees with the Commission's proposal that each of these services should retain the frequencies now in each service, with new frequencies going into a Public Safety pool category. ADPS suggests that as existing frequencies are relinquished, that they be placed under the Regional Planning Committee to be treated as generic Public Safety assignments and be assigned upon regional needs, not Service needs.

ADPS further suggests that a new channeling plan should be put into effect in the 150-174 MHz band that reassigns channels to individual services in consecutive order. These frequencies should be the responsibility of the frequency coordinator for that service. If the channels are later split further, each of the new channels within that coordinator's block would then be the responsibility of that coordinator. This will minimize the number of cross coordinations between coordinators and will also allow better planning and use.

For frequencies between 450-470 MHz, ADPS suggests that APCO be recognized as the sole coordinator of all frequencies, except the Emergency Medical Service, where the International Municipal Radio Service (IMSA) would continue their coordination. This will drastically reduce the number of cross coordinations between services. This is especially appropriate since most channels in the 450-470 MHz band are used for Police and Local Government communications.

EXTENDED IMPLEMENTATION:

ADPS recommends an extended implementation time in all frequency bands provided the licensee can show cause. Changes proposed in Docket 92-235 will affect hundreds of sites and cost millions of dollars. In addition, many municipal users may opt to convert to 800 MHz thereby freeing up many VHF and UHF frequencies for wide-area users. Implementation will be a time-consuming process and therefore justifies an extended implementation schedule.

FIXED OPERATIONS IN THE 150-174 MHZ AND 450-470 MHZ BAND:

ADPS advocates continued secondary fixed use in the 150-174 MHz and 450-470 MHz bands, but proposes that any such use be done within the applicant's own service. This change can be phased in over a 5 to 10 year period. There will never be a better time than now to initiate this process. It will result in a vastly simplified system of licensing and coordination. The benefits to Public Safety include better interference control, better control of system use, and simplified coordination and licensing.

LOW POWER OPERATIONS:

ADPS suggests that the 12.5 kHz center frequencies between high power frequencies in the 450-460 MHz band should remain low power secondary use, until 10 years after the NFR. At that

point, they should be classified full power. In Arizona, there is extensive use made of these channels, and to mandate immediate high power use on these channels would cause hardship on existing users.

For the 12.5 kHz center frequencies in the 460-470 MHz band, ADPS proposes that full high power primary operation be allowed immediately, subject to appropriate adjacent channel interference criterion as defined by the regional plan, until 10 years after the NFR. There are few existing Arizona low power users on these channels.

SUBPART O - TRANSMITTER CONTROL:

ADPS agrees that this subpart is superfluous and can be eliminated. It contributes nothing to overall system configuration, design or approval.

REDUCED PAPERWORK REQUIREMENTS:

Since the Commission claims that it does not use the technical showings it requires, this information should not be required to be furnished at all. It is possible, however, that the technical showings may still be required by the Regional Planning Committee to determine compliance with the regional plan. In this case, more, not less technical information will be required.

JUSTIFICATION FOR REGIONAL PLAN:

ADPS feels that the NPSPAC process has worked extremely well in all regions. This process involved all major Public Safety licensees in Arizona, and resulted in a balanced plan which afforded all eligibles the opportunity for input and the ability to request spectrum based upon

their needs. The process was definitely not done in a vacuum. To date, no complaints have been noted by any of the user-licensees. Since local users have the most knowledge about their actual needs, ADPS believes that another Regional Planning process should be initiated to plan for future frequency redistribution and reuse in the 150-174 MHz and 450-470 MHz bands.

JUSTIFICATION FOR 12.5 KHZ CHANNELS:

International APCO, the National Association of State Telecommunications Directors (NASTD), and the Telecommunications Industries Association (TIA) have spent the past two years working on what is known as APCO Project 25. This project is setting a standard that will lead to a platform describing how the next generation of land mobile radios will work. This project was aimed primarily at 800 MHz digital radios. ADPS suggests that the Communications solutions in refarming VHF and UHF frequencies must ultimately interleave with Project 25. It is also our understanding that the Interdepartmental Radio Advisory Committee (IRAC) within the National Telecommunications & Information Agency (NTIA) has already decided upon a course toward 12.5 kHz channels for all their systems by the year 2005.

Several manufacturers have notified us that they do not foresee providing 6.25 kHz FDMA

ADPS feels that 12.5 kHz channels are appropriate for the near-term future. ADPS does not foresee any possible conditions under which 5 kHz channels would be workable in the 150-174 MHz band anytime in the future.

Inter-operability is an essential reality in Public Safety. As governmental budgets get ever tighter, more interagency and mutual aid compacts are formed. These arrangements happen at all levels of government. We must have the ability to communicate with our constituent municipalities, as well as our neighboring states. There is also a need for more clear frequencies for disaster response and mutual aid, particularly in the 150-174 MHz and 450-470 MHz bands.

With all these unique Public Safety functions, ADPS believes that it is entirely appropriate that a separate part be generated strictly for public safety communications services.

TRANSITION PERIOD PHASES:

First Year Phase

ADPS advocates a step implementation process for a graceful transition into new systems. The State of Arizona does not have funding to accomplish significant changes in the immediate future. ADPS needs both time to plan and to request revenues through the legislative process, several years in advance for any major expenditure for radio equipment. Preferably, ADPS would like to amortize the millions of dollars in equipment we presently have in service, much of which is brand new, over at least a 10 year period.

In the first year after the NFR, ADPS advocates that all users reduce system deviation to 4 kHz maximum on all FM transmitters within 100 miles of the top 100 metropolitan markets. ADPS also suggests that coordinators require new licensees to have power levels and antenna patterns defined to conform with a 39 dBu (VHF) or 41 dBu (UHF) contour at the boundaries of the users service area. This requirement would apply to any request for a new system or site, for

any change in frequency, or for a change of transmitter power output (ERP). Computer programs are now available and affordable by most Public Safety entities to generate such contours. Rural licensees could be delayed until there are co-channel applications that affect their service areas.

In the 460-470 MHz band, 12.5 kHz offset channels should be allowed to operate full power primary use where there is no interference as certified by the Regional Planning Committee. ADPS also feels it appropriate to allow trunking on channels in the 460-470 MHz band at this time. Low power restrictions should remain on offset channels in the 450-460 MHz band.

radios designed for 15 kHz operation. At this point, the Regional Planning Committee would take all VHF channels under its purview. UHF channels would remain in a voluntary 12.5 kHz mode, with adequate dBu contour separation to protect grandfathered 25 kHz equipment.

Ten Year Phase

Ten years after the final NFR, ADPS suggests that all systems should be fully compliant at both VHF and UHF to the 12.5 kHz channel standards, and no special adjacent co-channel dBu protection should be afforded in future licensing. ADPS suggests that those agencies which convert to 12.5 kHz systems early, should be afforded special consideration in licensing additional channel space, especially at UHF where their own 25 kHz channel would be converted to (2) 12.5 kHz channels prior to the 10 year deadline. This approach would aid users in setting up trunked systems and other narrowband data systems which might be available.

ADPS also believes that the 10 year point would be the appropriate time for the Commission to issue another Notice of Inquiry (NOI) revisiting the issue of additional channel splitting, possibly to 6.25 kHz, with an eye toward backward compatibility to existing systems already converted to 12.5 kHz channels. ADPS feels that after ten years, the migration path will be much better defined, and probably somewhat obvious.

ADPS believes that trunking at VHF is entirely feasible as has been shown for trunking at UHF by several manufacturers in the European market. Arizona APCO has defined a VHF band plan, which includes trunking channels, and defines standard transmit/receive frequency splits. ADPS believes the Commission should take a good look at this plan for National implementation at the ten year point.

SUMMARY:

In summary, ADPS encourages the Commission to take a constructive approach to spectrum refarming in the 150-174 MHz and 450-470 MHz bands by doing the following:

1. Place Public Safety into a separate part of the rules.
2. Establish a new regional planning process for VHF and UHF.
3. Implement a 10 year plan to redefine channels to 12.5 kHz.
4. Implement a signal dBu contour concept for all systems.
5. Protect all grandfathered users for 10 years.
6. Defer any discussion of narrower channels for 10 years.

ADPS believes that following these general guidelines will provide the maximum benefit in spectrum efficiency in the long term, and will protect the essential Public Safety radio systems upon which the citizens of Arizona and the United States depend for their safety. ADPS urges the Commission to assume a 10 year stance in these sweeping changes, and to adopt a go-slow attitude where public budgets, and the public's welfare and safety are concerned.

Respectfully Submitted,

Richard G. Carlson, Assistant Director
Arizona Department of Public Safety